Neolithic Engineering in the 21st Century: An Innovative Design Using the Ball-and-Socket Model to Mitigate Seismic Effects on Contemporary Pacific Structural Designs

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Civil and structural engineers are always trying to build a better mousetrap, in this case multi-story buildings that could endure the extreme forces of Nature. Borrowing a simple yet clever engineering concept from Neolithic Chamorros—the ball-and-socket flexible joint of the latte—and applying it to 21st century structural engineering designs, buildings could better resist typhoon force winds and high magnitude earthquakes that frequent the Mariana Islands. For this experiment, the proportions of the actual diameter of the tasa to its height are 7:5. The same proportions are then applied to four different models—triangular, square, pentagonal, and hexagonal. To create the models with consistent and precise measurements, a 3-D printer is used 1) to show the pillar with the socket shape on the top and pivot points to place in the socket on the pillar, and 2) to create the bases of each floor. Next, integrate the different parts of the building together, placing the ball-and-socket equidistant from the center and its vertices. The ball-and-socket model is arranged in a staggered vertical orientation by story. Lastly, the finished models are placed on an earthquake simulator; an iRichter app records the magnitude. The results proved an age-old structural engineering truism: a triangular base is the most stable, generating a 21.5-degrees/second sway during a 5.71-magnitude earthquake, while the other bases, notably the square base, could manage no more than 1.55-degrees/second sway. If implemented, a structure’s aesthetics and functionality can change to better suit the environments of the western Pacific.

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